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Establishing a Regional Sanitary Landfill in the Kansas City Metropolitan Area

Mid-America Regional Council

1972

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ESTABLISHING A REGIONAL SANITARY LANDFILL IN THE KANSAS CITY METROPOLITAN AREA

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The Kansas City Metropolitan Area consists of three counties in Kansas and five in Missouri and covers approximately 3,800 square miles. The area is divided further by the Missouri and Kansas Rivers. The two largest cities are Kansas City, Kansas, and Kansas City, Missouri. In 1969, the Metropolitan Planning Commission-Kansas City Region (non Mid-American Regional Council-MARC), carried out a solid waste management planning study that led to recommendations about improving the system in the area. One of the most important recommendations was that sanitary landfilling should be used to dispose of solid waste collected within the area. The report considers the following topics: Site selection; site development; site operation; environmental assessment; economic assessment; and, public impact.

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ESTABLISHING A REGIONAL SANITARY LANDFILL

IN THE KANSAS CITY METROPOLITAN AREA

This open-file report (SW-43d)
on solid waste management demonstration grant No. G06-EC-00237
was written by DENNIS G. FENN, *U.S. Environmental Protection Agency*
and NICK ARTZ, *Mid-America Regional Council*

U.S. ENVIRONMENTAL PROTECTION AGENCY

1972

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ESTABLISHING A REGIONAL SANITARY LANDFILL IN THE KANSAS CITY METROPOLITAN AREA

BACKGROUND

The Kansas City Metropolitan Area consists of three counties in Kansas and five in Missouri and covers approximately 3,800 square miles. The area is divided further by the Missouri and Kansas Rivers. The two largest cities are Kansas City, Kansas, and Kansas City, Missouri. In 1970, the total population of the Kansas City Metropolitan Area was 1,327,266.

In 1969, the Metropolitan Planning Commission-Kansas City Region (now Mid-American Regional Council-MARC), carried out a solid waste management planning study that led to recommendations about improving the system in the area. One of the most important recommendations was that sanitary landfilling should be used to dispose of solid waste collected within the area. Other more costly processing and disposal methods were examined, but the investigators concluded that even if one of them were chosen, a large fraction of the total wastes collected would still remain to be disposed of on land. The land disposal alternatives were clear -- a dump or a sanitary landfill.

At the time of the study, solid wastes were disposed of at open dumps and few, if any, precautions were taken to prevent health hazards or to protect the environment. Since no sanitary landfills existed within the area to be used as examples, the probability of converting disposal practices seemed remote. In fact, many people in the area seemed to consider the word "sanitary landfill" synonomous with the word "dump". A need definitely existed, therefore, to physically demonstrate the advantages of the sanitary landfilling method through an actual operation and related public relations and training programs.

Figure 1. Open dumping was the common method of solid waste disposal in the Kansas City area.

Therefore, MARC, in cooperation with the City of Kansas City, Kansas, and the Department of Health, Education, and Welfare (now the U.S. Environmental Protection Agency) proposed to plan, design, develop, and operate a full-scale model sanitary landfill to promote and encourage intergovernmental cooperation in the area and to demonstrate to the entire metropolitan region the benefits sanitary landfilling offers as a final disposal method.

The first order of business was to select and acquire a site. After some preliminary engineering investigations of the available sites, a 46-acre ravine located in the urban northeastern part of Kansas City, Kansas, was chosen.

The site, bounded by residential and industrial areas, was purchased by the City with a grant from the U.S. Department of Housing and Urban Development (HUD). Since the site was located in a Model Cities Neighborhood, HUD stipulated that the completed sanitary landfill be developed into a park. This was consistent with MARC's final land use plans.

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Figure 2. Prior to the sanitary landfill development and operation, the site was a dump-ridden plot of land with some scattered residences.

Prior to purchasing the site, MARC met with the local citizens to inform them of the project. The main selling point was that a park would be available for use in a few years. MARC was successful in gaining the public's support and met very few objections.

SITE SELECTION

The site was initially chosen because it is close to areas that generate large quantities of solid wastes and is readily accessible. A large industrial district lies immediately northeast of the site, and the city's downtown district and a large portion of its residential area lie immediately to the south and west, respectively. Haul distances are, therefore, minimal for much of the solid waste generated within the city. Good access is provided by a four-lane road, and the entrance to the site is shielded from the surrounding residential area by loessial bluffs on the north end of the site.

Further investigations of the feasibility of developing and operating a sanitary landfill at this site began in January 1970. Such considerations as adequacy of on-site cover material, pollution potential, and compatibility of the finished sanitary landfill with the proposed ultimate land use were covered.

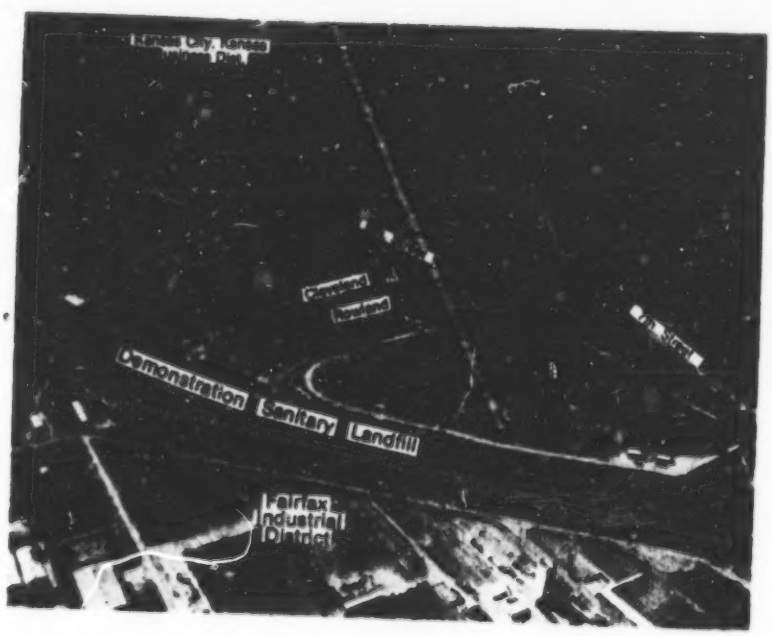

Figure 3. The site is close to the solid waste generation and is readily accessible. It is closely surrounded by residential and industrial areas.

Hydrogeological investigations were made to determine the type and quantity of soil, the groundwater conditions, and the potential for gas and leachate problems. Data obtained indicated that there were loessial soil deposits up to 70 feet thick in some locations. Reported groundwater levels indicated that excavating to depths of 65 feet would be feasible in certain areas. Only at the bottom of the ravine areas was the water table close enough to the surface requiring certain precautionary measures to protect the groundwater.

Because of the proximity of the residential areas and the existence of water wells immediately downstream from the sanitary landfill site, the potentials of water pollution and gas hazards were important considerations. In order to reduce the potential of these problems, special precautionary measures were recommended to be taken during site development.

SITE DEVELOPMENT

Plans and specifications for site development work were prepared, bids were accepted and work began in June 1971. The site development contract involved a considerable number of items which had been recommended in the preliminary site analysis report. Initial activities involved such tasks as site clearing and cleanup; construction of employee and maintenance facilities; installation of weighing facilities; construction of an entrance gate and a two-lane entrance road; the installation of recommended utilities, such as water, sewerage, gas, electrical, and telephone lines; and the installation of a six-foot chain link fence around the perimeter of the site.

Three drainage systems were also constructed to control water pollution and to impede decomposition of the refuse. The latter control is necessary to minimize the potential of gas problems and to minimize uneven settlement of the completed fill area to be used as a park. Drainage channels were constructed along the south, east, and west sides of the site, to prevent off-site drainage from entering the fill area.

Figure 4. Concrete lined trapezoidal drainage channels were constructed along the south, east, and west sides of the site.

A leachate drain and separate underdrain, both of eight-inch diameter perforated corrugated metal pipe, were installed along the bottom of the ravine. They are designed to collect any leachate that may emanate from the solid waste and to prevent the groundwater table from rising as the ravine is filled.

Another measure taken to help preclude both water pollution and gas hazards was the construction of an impermeable earth blanket on the side and bottom areas of the site. This blanket, composed of an 18-inch layer of loessial soil compacted to 90 percent proctor density at optimum moisture content is expected to form a large bathtub type container. Thus, leachate from the fill should be prevented from moving into the groundwater below, and lateral gas movement from the fill should be retarded. In addition to this liner, the potential for lateral movement of gas is further reduced by a perimeter venting system which is installed as part of the daily operations.

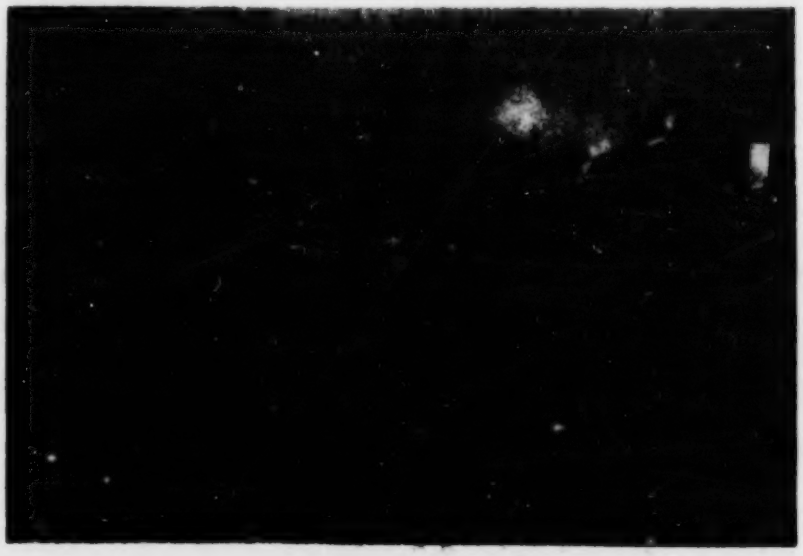

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Figure 5. The leachate collection pipe and underdrain were installed along the bottom of the ravine and covered with permeable sand. The walls of the ravine were also lined with an 18-inch soil barrier (shown by the dark soil areas).

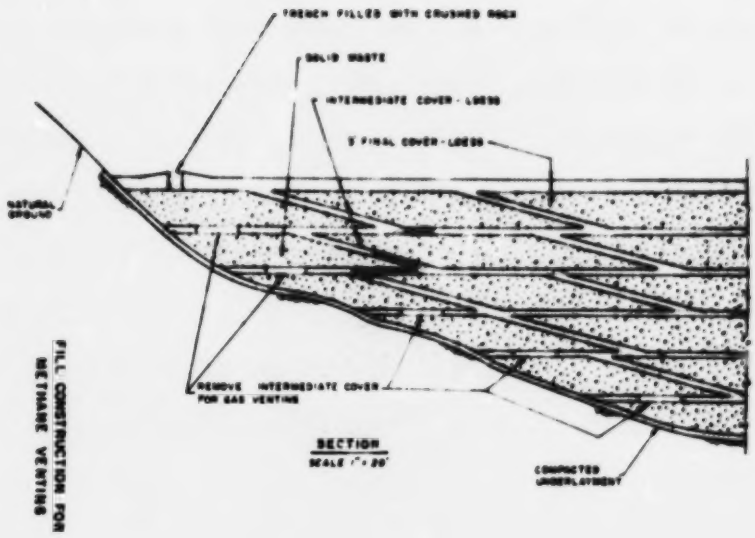

Figure 6. The perimeter gas vent system is constructed as the ravine is filled with solid waste by scraping off a portion of the cover material from each lift prior to placing the next lift of solid waste.

SITE OPERATION

Detailed operational plans and specifications were developed which established the order of filling and placed other necessary controls on the operational procedure. The operational contract was awarded to International Disposal Corporation of Kansas, and operations commenced on February 14, 1972.

After weighing, each load of solid waste is delivered to the working face where it is spread and compacted to the smallest practical volume possible utilizing the "area" method. A typical lift at this site consists of solid waste nine feet deep covered by one foot of soil. This procedure is perhaps the single most important item in this operation. It prevents vectors from becoming established, prevents precipitation and runoff from

readily leaching into the buried solid wastes, prevents blowing litter, and prevents unsightly appearance in an area immediately adjacent to residential development.

Figure 7. Each load of solid waste is disposed of by the area method utilizing proper sanitary landfill practices and equipment.

Efforts are continuously made to maintain a clean, sanitary, neat-appearing operation in good working order. Cleaning and janitorial services are provided daily within the buildings and all facilities plus equipment are continually maintained.

Final grading will be accomplished over each stage of the sanitary landfill after filling is permanently ended in an area. This will include the provision for an additional two feet of final earth cover over the one foot provided. The surface will be graded to the topography indicated in the plans to serve the purpose for which the fill is ultimately planned. A minimum slope of one percent will be maintained to assure proper drainage.

Minimum personnel requirements at the site include one foreman, two equipment operators, two laborers and a scaleman. One equipment operator operates a dozer at the working face of the fill while the other runs the second dozer to pull a scraper to haul earth cover material. The two laborers are used in maintenance and cleanup work, to control blowing debris, etc. The foreman oversees the operation, keeps records, and occasionally operates equipment in emergencies.

Equipment includes two crawler tractors, one pull scraper, one motor grader, one sheepsfoot roller, and one fabricated 1,500-gallon water tank truck.

At the site, detailed operational records are kept on costs, waste input, manhours, equipment hours, etc. These records provide data to determine trends, to estimate future needs, to establish fees, and to maintain a more efficient operation. During the first six months of operation, daily solid waste quantities received ranged from below 200 tons at the beginning to as much as 900 tons in later months. The average daily quantity during this period was approximately 550 tons. At this rate, the 550,000 ton capacity site is expected to have about a three-year life.

ENVIRONMENTAL ASSESSMENT

During the life of the project and for a necessary time thereafter, the site will be monitored for potential water pollution problems and gas hazards.

Four wells established around the site have been monitored by the Kansas State Department of Health since December 1970, over one year before operations began. Examination of the results of chemical and biological tests on samples from these wells indicate no significant change in the quality of the groundwater either during site preparation activities or after the beginning of operations. Monitoring of these wells is expected to continue over a period of 10 years to determine any long-range effects of the operation. No leachate has been collected thus far.

The proximity of the sanitary landfill to homes makes it mandatory to monitor for potential methane gas migration from the site. The monitoring program will require the installation of eight wells outside the solid waste fill area and on the periphery of the site. A monitoring program will then be initiated using portable instruments to detect the presence of any explosive gases in the wells. The program will be continued for several years until significant quantities of combustible gas are no longer being generated.

ECONOMIC ASSESSMENT

The project involves numerous cost items which may be separated into three basic categories: management, construction, and operational.

Management costs include administrative expenses, as well as engineering consultant fees. This would include such items as the preparation of reports, development of plans and specifications, and engineering supervision of development work and operations.

Construction costs included expenditures for site selection and development. These costs covered such items as soil borings and well drilling, scale equipment, buildings, drainag- facilities, earth underlayment work, final grading, access roads, and the establishment of a gas venting and monitoring system.

Operational costs include those associated with the daily disposal of incoming solid waste and all other items necessary and required in maintaining a clean, sanitary, neat-appearing, and trouble-free operation. Operational and management costs are directly related to daily solid waste quantities and the cost per ton will increase as the average daily quantity decreases.

Recent figures indicate that solid waste disposal rates at this sanitary landfill project will average about between 500 and 600 tons per day over the life of the project. This will result in a total project cost of over $2 million or about $4.00 per ton. Of this total cost per ton, management would be about $1.00, construction $1.20, and operations $1.80 per ton. It should be noted that due to the urban setting of this site and the extra training and public relations activities undertaken, extra construction and management costs are being incurred which probably would not be factors at most sanitary landfills.

PUBLIC IMPACT

One of the major roadblocks to obtaining any sanitary landfill site is public opposition from local residents. In order to win public acceptance for this project, support was initially gathered from trusted leaders and action groups in the area that surrounds the project. The main selling point was the park, subsequently named the John Garland Memorial Park,

which will result from the three-year operation. As a result of a well-planned public relations program, the project was accepted, although some public skepticism still remained.

Perhaps the main impact of this project is the effect it is having on the quality of land disposal practices throughout the Midwest, especially in the Kansas City Metropolitan Area. This project provides a facility that demonstrates to the public the advantages of sanitary landfilling and allows for the training of foremen and operators. The audiences that have toured the project include individuals from State and Federal regulatory agencies, local elected officials, professional people involved in environmental control, high school teachers, and other interested parties.

Disposal practices in the Kansas City Metropolitan Area have changed considerably since the beginning of this operation. With this project providing an acceptable disposal site for the area, the Kansas City-Wyandotte County Health Department has already closed one main county dump and six other smaller illegal operations. On May 8, 1972, a Municipal Court Judge of Kansas City, Kansas, fined a private operator $3,000 and sentenced him to 540 days in jail on six counts of violating the City's Solid Waste Management Ordinance. Additional cases are expected to be brought before the Court. With the efforts and support being developed on this project and with the implementation of State solid waste plans in Missouri and in Kansas, it is the expectation of the EPA that pressure will be brought to bear throughout the Kansas City Metropolitan Area to properly manage solid waste disposal practices.

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